



# Responsible Research and Innovation Associated With Risk Communication and Public Engagement on Health Emergency Preparedness at the Local Level

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Responsible Research and Innovation (RRI) associated with public health emergency preparedness (PHEP) and response pose major challenges to the scientific community and civil society because a multistakeholder and interdisciplinary methodology is needed to foster public engagement. In 2017, within "Action plan on Science in Society related issues in Epidemics and Total pandemics", twenty-three initiatives in eleven cities—Athens, Brussels, Bucharest, Dublin, Geneva, Haifa, Lyon, Milan, Oslo, Rome, and Sofia—represented effective opportunities for Mobilization and Mutual Learning on RRI issues in the matter of PHEP with different community-level groups. These experiences show that to effectively address a discourse on RRI-related issues in PHEP it is necessary to engage the local population and stakeholders, which is challenging because of needed competencies and resources. Under coronavirus disease 2019 (COVID-19) pandemic, we are proven that such a diversified multistakeholder engagement on RRI related to PHEP locally needs further elaboration and practical development.

**Keywords:** responsible research and innovation, public health emergency, risk communication, participatory governance, preparedness, response, pandemic, epidemic

## INTRODUCTION

"Everything in coronavirus disease 2019 (COVID-19) pandemic is about trust. So sometimes we tend to revert to technological solutions for what are essentially behavioral challenges for us all. The most innovation is needed right now in behavioral sciences on how we as communities and individuals: understand epidemics and behave during them, process information and advice, build trust. That's scientific as building vaccines". By these words, on March 2021, 17<sup>th</sup> Mike Ryan, Executive Director of the agency's Emergencies Programme at the

WHO, stated that everything about the pandemic because of COVID is about trust (World Health Organization (WHO), 2021a). In the field of public health emergency preparedness (PHEP), at a time when facing public health emergencies of international concern (PHEIC) as COVID-19 pandemic is one major commitment all over the world since early 2020, the response capacity of the single countries to such health threats—especially in the first stages—has been resulting heterogeneous and inadequate at most (World Health Organization (WHO), 2021b). But this is not definitely a new problem today: even in the past, most countries have been showing to rely only on the emergency response that is proven not to be the successful approach (Murray et al., 2015), or to deliver a poor-risk communication (Crosier et al., 2014). Examples of well-documented cases of lacking response capacity to public health threats regarded uncertainty and confusion to risk communication delivered during the A/H1N1 influenza pandemic (Expert Group on science, H1N1 and society (HEG), 2011) or the Ebola alert in 2014 (De Castaneda et al., 2015; European Commission (EC), 2015).

In 2009, in fact, critical pandemic communication was revealed to be definitely one of the major risk factors further damaging trust between citizens and health authorities (Expert Group on science, H1N1 and society (HEG), 2011). Since then, the gap between the scientific community and society has been minded at large, requiring to foster a constant, open, and two-way dialogue for public engagement (Owen et al., 2012). In the last decade, it has been highlighted that such a dialogue between science and the rest of society has never been more important (European Commission (EC), 2014). This concept has its roots in the speech by M. Geoghegan-Quinn at the conference «*Science in Dialogue. Toward a European Model for Responsible Research and Innovation (RRI)*» in Odense in 2012. RRI represents an inclusive approach to research and innovation (R&I) and refers to the need for societal actors (including researchers, citizens, policymakers, businesses, and civil society) to cooperate throughout the entire R&I process in order to ensure a better alignment of processes and results with societal values, needs, concerns, and expectations (Von Schomberg, 2013).

Framing an RRI operational model allows better chances for tackling the current grand challenges if all societal actors are fully engaged in the co-construction of innovative solutions, products and services, *via* inclusive participatory approaches, driven by the real needs of people and responding to the citizens' aspirations and ambitions (European Commission (EC), 2013). On the contrary, PHEP merges the characteristics of a highly complex adaptive system, such as public health, with elements of high uncertainty and rapid change posed by emergencies, and it needs constantly to reconcile work-as-imagined and work-as-done.

It is widely accepted that the active involvement of many of these groups (collectively indicated as “stakeholders”) is needed because beneficial to the quality, relevance, and impact of health research and practice (Heaton et al., 2016). Conversely, as confirmed in the current COVID-19 pandemic scenario, a generalized lack of trust in institutions affects civil society nowadays, leading to the expression “post-trust societies” (Löfstedt, 2005; Marmot, 2017). Broader consideration of an RRI

approach in the field of PHEP can thus serve as context to the desired outcome to create a blueprint for a better response to pandemics and PHEIC through intersectoral cooperation at different levels.

More recently, further exploitation of such interaction among different domains is retrievable in the 2030 Agenda for Sustainable Development adopted at the United Nations Summit in 2015, identifying 17 Sustainable Development Goals, SDGs (Von Schomberg and Hankins, 2019; Yaghmaei and Van de Poel, 2021). Although the third SDG explicitly addresses ensuring healthy lives and promoting well-being for all, up-to-date studies have specifically defined a number of 57 indicators referring to 33 targets and 12 health-related SDGs (Asma et al., 2019). In this way, the target of health emergency preparedness for strengthening the countries' capacity for early warning, risk reduction, and management of national and global health risks (SDG 3.d) is covered also by other goal-related indicators (Possenti et al., 2021).

## OBJECTIVES

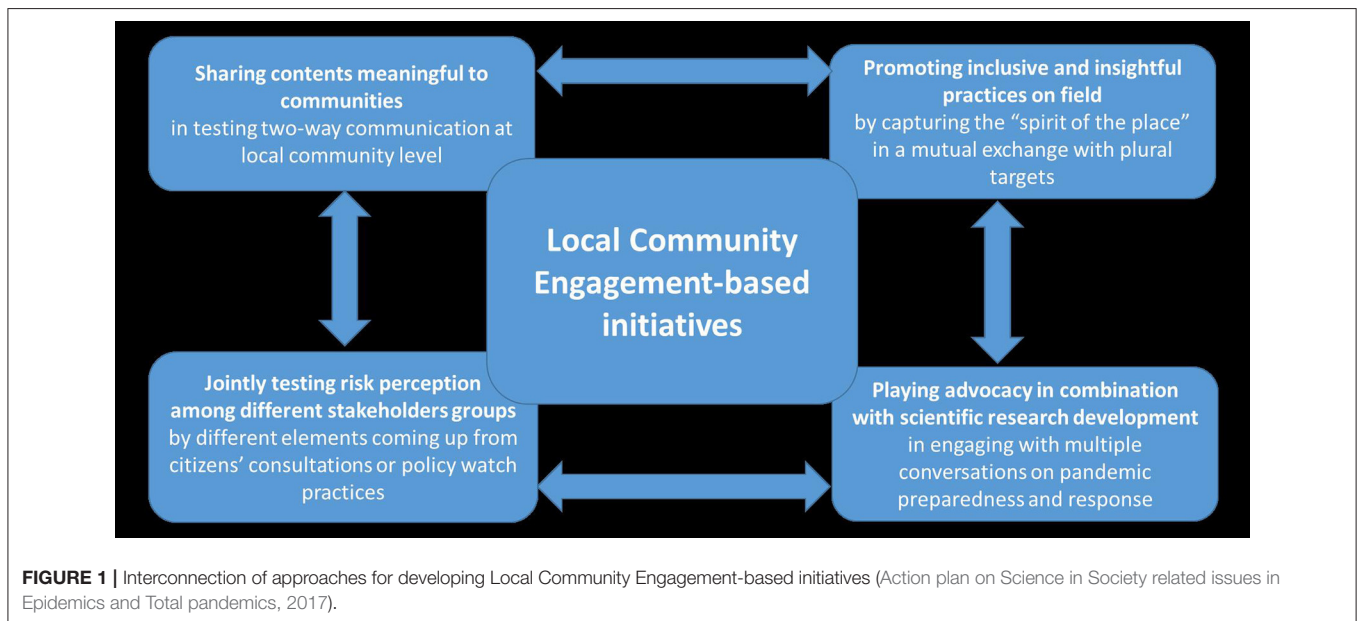
While COVID-19 occurring globally, it is worth describing what was developed in 2017 mainly, within the European Union (EU) work program of the “*Action plan on Science in Society related issues in Epidemics and Total pandemics*”. In this framework, the six RRI strategic areas as earlier operationalized by the European Commission (EC). (2014) were then further elaborated and adjusted to PHEP keys accordingly (Table 1). At first, elements relating to *Governance* of pandemics and epidemics are considered because R&I processes shall run under the lead of policymakers who are the first responsible for preventing harmful developments. Then, *Open Access* is to be conceived in the sense that—to be responsible—research data, scientific outcomes, and unsolved questions relating to epidemics and/or pandemics must be transparent and accessible to everybody and also *Science Education* is intended in form of participatory governance in crisis management. When PHEIC occur, *Ethics* is of paramount importance as R&I associated to health emergency conditions shall respect enforcement laws, fundamental rights, and display the highest ethical standards. Important instances on further aspects linked to *Gender Equity*—and inclusiveness—affecting scientific and societal domains in major epidemic or pandemic conditions are parental vaccine hesitancy or vaccination uptake during pregnancy. Finally, we have *Engagement* as per the mutual learning processes to develop joint solutions to societal problems and, in this case, referring to risk for intentionally caused outbreaks, biological warfare, and terrorism in democratic societies (Possenti et al., 2018).

## General Objectives

The work here described aim to bring some RRI themes and objectives into the public debate on the epidemics and pandemics, from a general discourse on state preparedness and response to the impact of vaccines and antiviral drugs as responsible, open and citizens-driven R&I processes. In a framework where the RRI approach and a participatory governance strategy seem to be the most suitable and consistent

**TABLE 1 |** Key issues for responsible research and innovation tailored onto public health emergency preparedness and risk communication Action plan on Science in Society related issues in Epidemics and Total pandemics, 2017.

Responsible research and innovation issues	Specific responsible research and innovation topics for public health emergency preparedness and risk communication
Governance	Governance of emergencies such as pandemics in the respective roles of international organizations, pharma industry, and media. One big deal is about manufacturing of new vaccines and anti-viral drugs.
Open access	Open Access to scientific outcomes and unsolved scientific questions occurring in pandemic situations, around: decision making process; nature and adequateness of preparedness plans; surveillance; risk communication; human behavioral changes.
Science education	Experiences of participatory governance, bringing research about major epidemics and pandemics closer to democratic institutions at all levels.
Ethics	Targeted ethical, legal and societal implications for fundamental rights within epidemics and pandemics.
Gender equity	Gender differences affecting exposures to epidemic outbreaks in terms of research to be enhanced on gendered outcomes or vaccination effects, improving communication, increasing awareness among health professionals, promoting statistical analyses stratified by genders.
Engagement	Problems posed by the risk of intentionally caused outbreaks, biological warfare and terrorism in democratic societies.



**FIGURE 1 |** Interconnection of approaches for developing Local Community Engagement-based initiatives (Action plan on Science in Society related issues in Epidemics and Total pandemics, 2017).

approach for restoring trust between citizens and health authorities (National Institute for Health Research (NHS), 2017), establishing a two-way, active and transparent communication represents the central step (Löfstedt, 2005; Marmot, 2017). The EU “Action plan on Science in Society related issues in Epidemics and Total pandemics” addressed a reflection on the rethinking of the research process within the RRI mainstreams associated with PHEP to include “citizen-scientists” as intellectual co-owners of projects by developing awareness and empowerment on their own. It was given expression to the need for consistent research on how to develop a massive public involvement related to PHEIC management, by implementing appropriate engagement tools and strategies (Possenti et al., 2018).

### Specific Objectives

The EU “Action plan on Science in Society related issues in Epidemics and Total pandemics” selected and elaborated key

issues to discuss with relevant target groups, developing joint solutions for citizens’ consultation, strategies of policy watch, and emergency risk communication. Among the widely ranged instruments elaborated to communicate effectively with stakeholders at the community level, a series of local initiatives was hosted in eleven cities: Athens, Brussels, Bucharest, Dublin, Geneva, Haifa, Lyon, Milan, Oslo, Rome, and Sofia. They offered a strong and multilayered opportunity to connect local, national, and international contexts to field test RRI-related issues and to enhance the transferability of promising policies and practices in the matter of PHEP.

The group of initiatives, delivered at the local level in 2017 mainly, represented in fact a valid occasion to have a conversation on a range of RRI issues related to PHEP with a varied plurality of targets from the civil society (health professionals, educators, policymakers, communicators, consumers, students, etc.) in

several community settings (universities, healthcare services, institutions, and civil administrations).

Although they were very diversified by targets involved, thematic triggers for discussion or setting of implementation, all the initiatives were based on the prevalent evidence that recalls intersectoral and multilevel cooperation approaches in delivering forms of institutionalized consultation and collaborative elaboration (World Health Organization (WHO), 2020). **Figure 1** shows the fourfold strategic approach grounding the Local Community Engagement-based initiatives (Geekiyana et al., 2021). The first function of sharing content meaningful to communities inform both jointly testing risk perception among different kinds of stakeholders and promoting inclusive and insightful practices on the field. These two last feed up and interrelate with playing an advocacy role in combination with scientific research development. The graphic displays circularly how experiencing two-way communication and treasuring other engagement initiatives are embedded in the community living environment in order to deploy multiple conversations on pandemic preparedness and response (Action plan on Science in Society related issues in Epidemics and Total pandemics, 2017).

## METHODS

Based on the evidence that public engagement is a necessary condition to address societal challenges since 2009, Mobilization and Mutual Learning (MML) was identified as a meaningful strategy to engage citizens and civil society in research and related policies. This specific approach was designed to create mechanisms for effectively tackling scientific and technology-related challenges faced by society, by proactively bringing together different actors with complementary knowledge and experiences.

More in detail, the three functions characterizing MML are as follows: (1) to *connect*—in terms of contribution by the common citizen to the development lines of the research community; (2) to *communicate*—about exploring existing resources to foster a dual-way communication among different stakeholders, and creating spaces to share experiences, best practices, and proposals of actions leading; and (3) to democratize the society. The latter is highly complex to deliver because its achievement requires promoting stable frames where, for example, the common citizen, especially if belonging to marginalized groups, can participate and converse with decision-makers and other stakeholders, having the chance for a real say in the research agenda-setting (European Commission (EC), 2012). Furthermore, MML provides a methodology to adapt the governance of research and technological development to facilitate the delivery of sustainable and inclusive solutions for key societal challenges. So far, the application of MML produced rich insights and also raised important questions on processes for the governance of science: main strengths (a flexible methodology to action, an open instrument to civil society that can use it as a platform to advocacy) can be highlighted on the

one hand but also several areas for improvement (need for capacity building, better competences, and solid methods) on the other.

The initiatives here presented were MML-driven actions to embed RRI principles to priorities including the governance of science and the use of science for governance, accountability to and participation of a wide range of stakeholders. They represented test opportunities that stimulated local-scale conversations with community-based groups, including general population categories, technical targets, and relevant stakeholders on strategic areas and different RRI-related topics in the field of PHEP, such as vaccines/vaccinations and citizen or multistakeholder engagement. These experiences activated in fact the collective intelligence of one or more groups in order to find new solutions to shared challenges. The local initiatives were actually practical examples to offer a model of change to build a more resilient society as a whole as to make it easier to acquire the mastery in terms of knowledge, attitudes, and behaviors in case of PHEIC (Action plan on Science in Society related issues in Epidemics and Total pandemics, 2017).

## RESULTS

It was totaled a number of twenty-three local initiatives under the auspices of MML, involving different academic institutes, research centers, policy agencies, non-government/civil society organizations, and private sector organizations from throughout Europe and Israel.

Although context-specific activities, at their very base they implemented MML instruments and tools, sharing indeed the common development of citizens' awareness, empowerment, and action on the RRI mainstreams in the field of PHEP. **Table 2** shows the participation size for a single initiative: some of them were more intensive and highly interactive with a few participants [6, 13, 17] in the form of a focus group or similar, instead of others privileged divulging purposes and targeted wider audiences [5, 8]. The overall distribution per participation rate was quite balanced: twelve initiatives were small-sized (<fifty participants), three engaged a range of fifty-one hundred people, and eight addressed more than one hundred individuals. The same balancing in terms of participants' number applied to the cities hosting the initiatives, considering Eastern vs. Western countries. In the Balkans—namely, Greece, Bulgaria, Romania—and the Middle East, i.e., Israel, a total of ten initiatives was developed: five involving more than one hundred people; two engaging with fifty-one hundred individuals; and three to a smaller public (<fifty participants). In the Western Europe (Norway, Ireland, Belgium, France, Switzerland, Italy) a higher number was totaled [ $N =$  thirteen], but achieved lower participation rates: in nine initiatives less than fifty people partook, instead, one and three occasions gathered, respectively, fifty-one hundred and more than one hundred individuals. In terms of type and profile of population groups involved, apart from four online surveys [3, 5, 12, 23], the initiatives took place in three settings mainly: institutional context [2, 16–18, 20] such as National Institutes of Health or Healthcare Services [8, 11, 19]

**TABLE 2 |** Coverage of the local initiatives on responsible research and innovation issues relating to public health emergency preparedness in eleven cities Action plan on Science in Society related issues in Epidemics and Total pandemics, 2017.

CITY [COUNTRY]	n.	SETTING	PARTICIPANTS	
			N	Type
Athens [Greece]	1.	University	26	Healthcare students
Brussels [Belgium]	2.	Institutional	123	Officers, civil protection authorities
Bucharest [Romania]	3.	<i>On line survey</i>	570	2 <sup>nd</sup> year medical students (400); 3 <sup>rd</sup> year medical students (20); 4 <sup>th</sup> year midwifery and nursing (50); others (100)
	4.	University	50–100	2 <sup>nd</sup> year midwifery students (9); 2 <sup>nd</sup> year medical students (55); others (n.s)
	5.	<i>On line survey</i>	260	2 <sup>nd</sup> year medical students
Dublin [Ireland]	6.	University	9	Female students
Geneva [Switzerland]	7.	University	50	Health professionals and healthcare students from Geneva university hospital
	8.	Healthcare service	2,000	Health professionals from private clinics, public hospitals, medical centers
Haifa [Israel]	9.	School	n.s.* [>100]	High school students
	10.	University	n.s.* [>100]	Health professionals, healthcare students, stakeholders
Lyon [France]	11.	Healthcare service	n.s.* [<50]	Health professionals, stakeholders, general population
	12.	<i>On line survey</i>	65	Healthcare students
	13.	University	8	Healthcare students
Milan [Italy]	14.	Airport	22	Officers, authorities, police/army/law enforcement officers
	15.	Museum	n.s.* [>100]	General population
Oslo [Norway]	16.	Institutional	25	Health professionals, Officers, civil authorities, defense agencies
Rome [Italy]	17.	Institutional	10	High school students
	18.	Institutional	20	Officers, civil protection authorities, defense agencies
	19.	Healthcare service	40	Health professionals, recently/currently pregnant women
Sofia [Bulgaria]	20.	Institutional	21	Health professionals (63%); healthcare students (37%)
	21.	University	73	
	22.	University	20	
	23.	<i>On line survey</i>	156	

\*n.s.: not specified.

such as hospitals or local health units, and medical university [1, 4, 6, 7, 10, 13, 21, 22]. One event was fully school-based [9] and other two initiatives occurred in non-conventional settings, such as an international airport [14] or a museum of comics [15]. In six initiatives, the intended target was lay public: general population in Lyon [11] or in Milan [15], high school students in Haifa [9] and in Rome [17], groups of recently/currently pregnant women [19]; whereas in nineteen cases there was an involvement of technical stakeholders, and two actions were target-blended. Health professionals [7, 8, 10, 11, 16, 19–23] and healthcare students at the university [1, 3–5, 7, 8, 10, 12, 13, 21–23] were the main technical targets involved; a certain participation of authorities and experts in the field was achieved as well [2, 10, 11, 14, 16, 18] (Table 2).

Table 3 reports the distinction for—main and secondary—thematic triggers that identify the issues used to activate the MML method. Twelve initiatives in six cities—Brussels, Bucharest, Geneva, Lyon, Oslo, and Sofia—were developed starting from the citizen consultations carried out in there previously implementing the so-called ‘Danish model’ for technology assessment based on the public participation and deliberation (Haukeland, 2017). In Haifa [9] and Rome [17], a matter of science education was mostly addressed because of high school students’ involvement. Initiatives n. 14 and 18 focused on

crisis management mainly. Vaccines and vaccinations served as major MML trigger in four cases, three as per behavioral factors [6, 15, 19] and one on communication issues [11]. Scientific research played a relevant role in the three events and to five initiatives as MML secondary trigger. The latter was represented by risk communication [1, 3–5, 9, 10, 15], multistakeholder engagement [7, 8, 11, 14, 18, 20], policy watch twice [2, 16], risk perception, social determinants, and law enforcement with one single occurrence (respectively [6, 17, 19]).

As indicated, “vaccine, vaccination or immunization” were the most recalled contents and associated keywords (Action plan on Science in Society related issues in Epidemics and Total pandemics, 2017). The initiatives mostly dealing with vaccine-related issues were the three in Lyon [11–13] and the one in Dublin, followed by two experiences in Italy [15, 19] and the two in Israel as well [9, 10]; three initiatives only did not cover this subject [14, 17, 18] (Table 3).

## DISCUSSION AND CONCLUSION

The overall picture shows that the initiatives delivered within a EU scenario addressed the relevant “assets” for RRI action related to PHEIC preparedness and response according to a

**TABLE 3 |** Mobilization and mutual learning triggers of the local initiatives on responsible research and innovation issues relating to public health emergency preparedness in eleven cities Action plan on Science in Society related issues in Epidemics and Total pandemics, 2017.

City[Country]	n.	Setting	Mobilization and mutual learning	
			Main trigger	Secondary trigger
Athens[Greece]	1.	University	Scientific research	Risk communication
Brussels[Belgium]	2.	Institutional	Belgian citizen consultation	Policy watch
Bucharest[Romania]	3.	<i>On line survey</i>	Scientific research	Risk communication
	4.	University	Romanian citizen consultation	
Dublin[Ireland]	5.	<i>On line survey</i>		
	6.	University	Vaccine behavior	Risk perception
Geneva[Switzerland]	7.	University	Swiss citizen consultation	Multistakeholder engagement
	8.	Healthcare service		
Haifa[Israel]	9.	School	Science education	Risk communication
	10.	University	Scientific research	
Lyon[France]	11.	Healthcare service	Vaccine communication	Multistakeholder engagement
	12.	<i>On line survey</i>	French citizen consultation	Scientific research
	13.	University		
Milan[Italy]	14.	Airport	Crisis management	Multistakeholder engagement
	15.	Museum	Vaccine behavior	Risk communication
Oslo[Norway]	16.	Institutional	Norwegian citizen consultation	Policy watch
Rome[Italy]	17.	Institutional/School	Science education	Social determinants
	18.	Institutional	Crisis management	Multistakeholder engagement
	19.	Healthcare service	Vaccine behavior	Law enforcement
Sofia[Bulgaria]	20.	Institutional	Bulgarian citizen consultation	Multistakeholder engagement
	21.	University		Scientific research
	22.	University		
	23.	<i>On line survey</i>		

multilayered perspective. This group of RRI initiatives applied in fact to PHEIC management adopting the two-way conversation approach not to just “make people chat”, but to include and let different societal stakeholders play an active role, made of empowerment and effective engagement. At first, technical stakeholders in the field represented the more frequently involved target groups, relying on the fact that medical doctors and also the health professionals more in general are definitely recognized as crucial figures in the PHEP scenario (Expert Group on science, H1N1 and society (HEG), 2011). This aspect relates to the advocacy role played by healthcare workers, both according to the general population perspective [*“If I was told by my doctor that vaccination is important and should I do it, I would vaccinate”*] and in the healthcare students’ opinion itself [*“Both concepts of community preparedness and inclusion became more understandable and it has become clearer the role of society and health care professionals has become clearer”*; *“the majority of the information presented were quite something new and different for them, who are at the beginning of their road to becoming healthcare providers... the questions raised my attention concerning some issues that I wasn’t thinking until now”*]. It emerges how relevant is targeting not only experienced practitioners and health professionals, but also medical and nursing students (Xiang et al., 2017). The relevance of the training setting is in fact confirmed to be an evidence-based

context for interventions of prevention and health promotion in general (St Leger, 1999) and above all in the field of PHEP. As already indicated earlier, gender pattern is one of the six RRI drivers: just two initiatives greatly involved women [6, 19], and both the events through an extensive female engagement or largely referring to the life course approach, as per their role of mothers or caregivers, in particular toward vaccine attitudes. Vaccinations constitute the core focus for most of the initiatives, which raised issues such as the participatory experiences that were about consulting 430 citizens from eight European countries—Bulgaria, Denmark, France, Ireland, Italy, Norway, Romania, and Switzerland—(Haukeland, 2017). Only two initiatives [9, 15] incorporated the concepts of *“similarities between art and science, as both require observation, intuition, inspiration and passion”*, which stand as principles in developing local community engagement through an MML approach (Cunningham, 2015). Basing on the relevant role of emergency risk communication when an epidemic is on the horizon, a cross-sectoral methodology is confirmed to be determinant to make people more actively engaged on RRI topics, and thus beneficial to the crisis management overall (Moore et al., 2017). Under COVID-19 pandemic circumstance, in fact, the World Health Organization (WHO). (2020) highlighted this kind of methodology calling for an approach that encompasses “risk communication and community engagement” (RCCE)

together. It is known that citizens positively partaking in consultations consider themselves as competent: they feel to be able participating in the decision-making processes by providing valuable data and knowledge, concerns, and useful information, but also by disseminating evidence released by authorities (Rufo, 2017; Alleva and Macri, 2018). Actually, cases of PHEIC might represent good examples to mobilize population about (Nabatchi and Leighninger, 2015), because of global interest and, conversely, finely accessible to people for required level of health literacy (World Health Organization (WHO), 2009; Catford, 2010; Batterham et al., 2016; Buyx et al., 2017).

The MML initiatives on RRI-related issues in the field of PHEP provided a platform for giving voice to communities on debates at different levels, from the local to national and international dimensions. The local initiatives represented, in fact, a diversity of interests: the spectrum of motivations at their base ranged from somewhat instrumental, “deficit-model” oriented motivations (for example, on enhancing trust in/legitimacy of science and technology) to others focused on more “genuine” opportunities for developing meaningful approaches to the democratization of science (such as, increasing participation of marginalized groups in the development of scientific agendas). A common theme emerged among the varied actor types, pointing to a “collaborative imperative”, expressed both as a need and a desire for cooperation between researchers and wider stakeholders, and many conversations about the current strengths of the MML instrument were framed in terms of benefits to wider processes of public engagement in research. The consensus was generally around discussing that the MML offered an important means of bringing science and related R&I processes out of its “ivory tower”, and promoted a “methodology for action”. Through the MMLs cooperative mandate, participants felt they had been enabled to share good collaborative practice and ideas, allowing for careful reflection on the broader context of knowledge construction. These experiences reflected on cultural and organizational learning issues, such as reducing institutionalized prejudice against working in collaboration with non-scientific partners. As a result, addressing RRI-related issues in the field of PHEP by MML was seen as beneficial to the development of new forms of knowledge, and moreover, the generation of new issues and ideas, and unexpected outcomes.

The local initiatives expressed the MML function to *connect* in terms of finding ways to better link local issues to global ones, up to a transnational level. Furthermore, “connecting” referred to a need to address cooperation gaps between different stakeholders from academia, policymakers, civil society, and the private sector. Not surprisingly, however, such gaps were differently framed by diverse actor types. For instance, it was argued that industry, in connecting better with civil society, could have better access to social attitudes about drugs or vaccines. Researchers in contrast could benefit from links to civil society to make their activities more socially relevant, and based on social needs. In the matter of RRI applied to PHEP issues, it was emphasized that similarly modeled initiatives could contribute to improving the ability of the general public to access data.

About the function of MML to enable *communication* across different stakeholders, it was highlighted the relevance of communication processes within the formal learning system, such as university or school in general, and also with the policymakers, in order to keep them abreast of developments in research agendas and informed of new avenues for investigation development. In this regard, the role that media—traditional and new ones, including social networks—play as a source of real-time news was highlighted as a valuable means of presenting and widening public debate on controversial issues.

On the MML role of transformation and innovation, the participants in the local initiatives insisted that MML should act as a tool for *democracy*, allowing different categories of stakeholders, and particularly marginalized social groups, to have a voice in decision-making processes. This approach should be thus a force of empowerment, creating space to bring “activist knowledge” and newly society-driven concepts to bear on research agenda setting, and fully embedding the civil society in research processes. In this regard, the local initiatives could be seen as experimental “democracy labs”, acting to “seed” a sustained dialogue on a systematic science/policy interface. These experiences were a sort of “gateway”, through which non-scientists can access, and ultimately transform the “scientific enterprise” of knowledge production. In adopting/implementing such institutional and cultural innovations, MML methodologies would then make a significant contribution to the ability of policymakers to develop more robust, socially relevant research agendas and find better solutions to societal challenges.

The local-level initiatives here described rooted in the EU context and might represent just examples to upscale, in order to tackle major RRI issues related to PHEIC management, even more in the light of the current COVID-19 pandemic. Anyway, the adoption of coordinated initiatives, tailored onto population requests and specific cultural and regulatory context, remains a great challenge still, but it is definitely one of the desirable solutions to implement. Health authorities should then devote structured efforts, substantial attention, and increased resources to “listen actively” to civil society groups and key stakeholders by promoting a reflective dialogue, even in view of greater trust outcomes, which, in turn, are sensitively influenced by honesty and transparency (Löfstedt, 2005; Expert Group on science, H1N1 and society (HEG), 2011; Marmot, 2017; Possenti et al., 2018). If on the one hand, governance should lead to RRI advancement and promotion of ethical framework for R&I, on the other hand, results as community resilience are more likely to occur when citizens’ interests and values are further embedded in R&I. Accessibility and use of research results, formal and informal opportunities for science education, and improved forms of scientific science communication complete the picture of participatory governance.

To address effectively RRI questions in the matter of epidemic or pandemic management, the political and expert commitment needs to focus on a holistic approach including the following: (1) multicomponent methodologies (preventive measures such as non-pharmacological interventions or vaccines); (2) multilevel efforts (targeting individuals or communities); (3) multiple setting interventions (hospital, primary care, or other centers)

under an integration and synergism umbrella. The whole is, in fact, greater than the sum of its single parts, and such an approach is potentially declinable into real world, by using infrastructure and resources that already exist in many communities. Better PHEP in an RRI perspective is possible to gain by a multitiere strategic commitment intended as a “governance chain” among health professionals, schools, community organizations, leaders, healthcare and local authorities such as municipality, counties, and regional governments. The community-based approach of programs, characterized by highly integrated social, behavioral, and environmental interventions, is proven to determine actual positive changes (Hendriks et al., 2015).

To effectively reach out and engage with the local communities on RRI, cultural differences need to be recognized, because policies and investments might be further strategically oriented by knowing what people want and think. It applies not just when there is a health threat on the horizon, but continually and especially in pre-event phases. To date, building a transparent and open risk communication to restore citizens’ trust (Löfstedt, 2005; Marmot, 2017) is clear on a theoretical level, but quite hard to put into practice because authorities are asked to develop a long-term strategy that requires investments on many aspects. Conversely, despite the urgency for larger financial investment, it is a very difficult area where financing is cut on a regular basis. Furthermore, although the civil society wants to contribute actively, experience also shows that R&I questions on how to better engage with public without unwanted interferences are still open: who should represent societal stakeholders (Possenti et al., 2017)?

Nowadays, recalling the narration of local community-level initiatives during a global long-lasting pandemic reinforces the concept that, to cope effectively with PHEIC applying an RRI perspective, not only medical or healthcare interventions are sufficient, but a pretty more complex approach is needed—as indicated earlier, integrated and systemic (multicomponent, multisetting, and multilevel). RRI-related issues are in fact fully addressed by capturing the ‘spirit of the place’ with population and relevant stakeholders locally that, in turn, is again a factor linking to the cultural peculiarity and society-specific characteristics. If countries are strongly encouraged to embed participatory strategies for appropriate risk communication in their own PHEP chain and associated plans, it is clear that it represents a great opportunity to policymakers and health authorities at the central level, but also a challenge due to the needs of specific competencies and dedicated resources.

What was field experimented some years ago—in non-pandemic times—allows us to identify the main challenges in terms of RRI applied to PHEIC. Through those practices were developed in the EU context, we could recognize some outstanding elements: participatory governance of the R&I purposes, responsiveness in the matter of policy orientation, and the framing of responsibility itself in the R&I context as collective activities with uncertain and unpredictable consequences. This

said, we fully acknowledge that despite prevalent insights concerning a neglected topic, such as, PHEP under an RRI perspective, were envisaged up to 2 years ago, several limitations featured the promotion of the local initiatives analyzed. First of all, the selection of settings for the initiatives delivery was operated in a purely EU framework and the choice of each initiative characteristics followed accordingly, with a diversity of targets involved and discussion issues. All experience generated was just an original but preliminary starting point, much depending upon the concrete implementation contexts such as by social, economic, cultural, and organizational aspects. Conversely, the limitation in terms of EU implementing program might stand as novelty itself, because broader literature is available on RCCE dealing with epidemic or pandemic preparedness and response in other areas of the Globe, such as in the South where several major PHEIC (e.g., Ebola Virus Disease or Zika Virus) have been occurring within the last decade.

In the end, since COVID-19 has spread out all over the world, we have been confirmed as never before that R&I may be said responsible if conducted for substantive and normative reasons, and not to expedite progress instrumentally toward predefined goals.

## AUTHOR CONTRIBUTIONS

VP designed the study overall, contributed to merge all data collected drafting the article since its very first versions, and throughout the several revisions of the manuscript that followed. BD contributed to strengthen the rationale of the manuscript and the internal consistency overall. AK, MG, KHD, RV, Ad’O, MS-E, VM, PK, KB, AB, and MIP engaged in providing a detailed input on the Country-specific information as well as about the experiences described as a whole. DG gave a substantial contribution to the critical interpretation of the data and played a major role in the implementation of the original program. All authors contributed to the article and approved the submitted version.

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## REFERENCES

- Action plan on Science in Society related issues in Epidemics and Total pandemics (2017). Mobilisation and mutual learning. Local initiative report. [http://www.asset-scienceinsociety.eu/sites/default/files/d5.3\\_-\\_local\\_initiative\\_report.pdf](http://www.asset-scienceinsociety.eu/sites/default/files/d5.3_-_local_initiative_report.pdf) (accessed February 17, 2021).
- Alleva, E., and Macri, S. (2018). From dissemination to citizen science. *Annali Istituto Superiore di Sanità*. 54, 4–5.
- Asma, S., Lozano, R., Chatterji, S., Swaminathan, S., Marinho, M. F., Yamamoto, N., et al. (2019). Monitoring the health-related sustainable development goals: lessons learned and recommendations for improved measurement. *Lancet*. 395, 240–246. doi: 10.1016/S0140-6736(19)32523-1
- Batterham, R. W., Hawkins, M., Collins, A., Buchbinder, R., and Osborne, R. (2016). Health literacy: applying current concepts to improve health services and reduce health inequalities. *Public Health*. 132, 3–12. doi: 10.1016/j.puhe.2016.01.001
- Buyx, A., Del Savio, L., Prainsack, B., and Völzke, H. (2017). Every participant is a PI. Citizen science and participatory governance in population studies. *Int. J. Epidemiol.* 46, 377–384. doi: 10.1093/ije/dyw204
- Catford, J. (2010). Implementing the Nairobi call to action: Africa's opportunity to light the way. *Health Promot. Int.* 25, 1–3. doi: 10.1093/heapro/daq018
- Crosier, A., McVey, D., and French, J. (2014). By failing to prepare you are preparing to fail: lessons from the 2009 H1N1 'swine flu' pandemic. *J. Public Health*. 25, 135–139. doi: 10.1093/eurpub/cku131
- Cunningham, D. (2015). The facts in the case of Dr. Andrew Wakefield. In: Cunningham, D. *Science tales: lies, hoaxes and scams*. Hardcover. p. 45–60.
- De Castaneda, R., Valticos, A., Pittet, D., and Flahault, A. (2015). MOOCs (massive online open courses) as innovative tools in education in infection prevention and control: reflections from the first MOOC on Ebola. *Antimicrob. Resist. Infect. Control*. 4, O16. doi: 10.1186/2047-2994-4-S1-O16
- European Commission (EC). (2012). Mobilisation and Mutual Learning (MML) Action Plans: future developments. Workshop–17-18 April 2012. Final Report.
- European Commission (EC). (2013). Responsible Research and Innovation. Options for strengthening responsible research and innovation. Available online at: <https://op.europa.eu/it/publication-detail/-/publication/1e6ada76-a9f7-48f0-aa86-4fb9b16dd10c> (accessed February 17, 2021).
- European Commission (EC). (2014). Responsible Research and Innovation. Europe's ability to respond to societal challenges. Available online at: [https://ec.europa.eu/research/swafs/pdf/pub\\_rri/KI0214595ENC.pdf](https://ec.europa.eu/research/swafs/pdf/pub_rri/KI0214595ENC.pdf). (accessed February 17, 2021).
- European Commission (EC). (2015) Conference summary report. Conference "lessons learned for public health from the Ebola outbreak in West Africa – how to improve preparedness and response in the EU for future outbreaks. Mondorf les Bains, 12-14 October 2015. Available online at: [http://ec.europa.eu/health/sites/health/files/preparedness\\_response/docs/ev\\_20151012\\_sr\\_en.pdf](http://ec.europa.eu/health/sites/health/files/preparedness_response/docs/ev_20151012_sr_en.pdf). (accessed February 17, 2021).
- Expert Group on science, H1N1 and society (HEG). (2011). Science, H1N1 and society: Towards a more pandemic-resilient society. [https://ec.europa.eu/research/swafs/pdf/pub\\_archive/sis-heg-final-report\\_en.pdf](https://ec.europa.eu/research/swafs/pdf/pub_archive/sis-heg-final-report_en.pdf). (accessed February 17, 2021).
- Geekiyang, D., Fernando, T., Keraminiyage, K. (2021). Mapping Participatory Methods in the Urban Development Process: A Systematic Review and Case-Based Evidence Analysis. *Sustainability* 13, 8992. doi: 10.3390/su13168992
- Haukeland, J. (2017). Not how, but why citizens could be included in policies on public health? (pp. 3–5). The role of citizens in epidemic preparedness and response. (pp. 6–10). In: *The role of citizens in times of an epidemic or pandemic. Paper series 6*. Zadic srl, Rome, Italy. Available online at: [http://www.asset-scienceinsociety.eu/sites/default/files/paper\\_series\\_6\\_-\\_the\\_role\\_of\\_citizens\\_in\\_times\\_of\\_an\\_epidemic\\_or\\_pandemic.pdf](http://www.asset-scienceinsociety.eu/sites/default/files/paper_series_6_-_the_role_of_citizens_in_times_of_an_epidemic_or_pandemic.pdf). (accessed February 17, 2021).
- Heaton, J., Day, J., and Britten, N. (2016). Collaborative research and the co-production of knowledge for practice: an illustrative case study. *Implem. Sci.* 11, 20. doi: 10.1186/s13012-016-0383-9
- Hendriks, A.-M., Jansen, M. W. J., Gubbels, J. S., De Vries, N. K., and Kremers, S. P. J. (2015). One more question to guide the development and implementation of health in all policies: integrate? *Health Promot. Int.* 31, 735–737. doi: 10.1093/heapro/dav029
- Löfstedt, R. E. (2005). *Risk Management in Post-Trust Societies*. Palgrave – MacMillan. doi: 10.1057/9780230503946
- Marmot, M. (2017). The art of medicine. Post-truth and science. *Lancet*. 389, 497–498. doi: 10.1016/S0140-6736(17)30207-6
- Moore, R., Haukeland, J., Bitsch, L., and Possenti, V. (2017). Views from the general public on communication and information in dissemination during a pandemic; results and experiences from the 2016 Irish citizen consultation. In *The role of citizens in times of an epidemic or pandemic. Paper series 6*. Zadic srl, Rome, Italy, pp. 11–13. Available online at: [http://www.asset-scienceinsociety.eu/sites/default/files/paper\\_series\\_6\\_-\\_the\\_role\\_of\\_citizens\\_in\\_times\\_of\\_an\\_epidemic\\_or\\_pandemic.pdf](http://www.asset-scienceinsociety.eu/sites/default/files/paper_series_6_-_the_role_of_citizens_in_times_of_an_epidemic_or_pandemic.pdf). (accessed February 17, 2021).
- Murray, K., Hajdók, E., Mesdag, F., Morosini, R., Nédée, A., Opalska, A., et al. (2015). *Cross Border Health Threats*. European Health Parliament.
- Nabatchi, T., and Leighninger, M. (2015). *Public Participation for 21st Century Democracy*. John Wiley and Sons. doi: 10.1002/9781119154815
- National Institute for Health Research (NHS) (2017). Public engagement: a practical guide. Sense about science: Because evidence matters. Available online at: <http://senseaboutscience.org/wp-content/uploads/2017/11/Public-engagement-a-practical-guide.pdf>. (accessed February 17, 2021).
- Owen, R., Macnaghten, P., and Stilgoe, J. (2012). Responsible research and innovation: from science in society to science for society, with society. *Sci. Public Policy*. 39, 751–760. doi: 10.1093/scipol/scs093
- Possenti, V., De Mei, B., Scardetta, P., Haukeland, J., Bitsch, L., d'Onofrio, A., et al. (2017). Improving preparedness to respond to epidemics and pandemics: the ASSET EU project. *Eur. J. Public Health*. 27, 453. doi: 10.1093/eurpub/ckx186.149
- Possenti, V., De Mei, B., Scardetta, P., Kurchatova, A., Green, M., Drager, K. H., et al. (2018). The ASSET research project as a tool for increased levels of preparedness and response to public health emergencies. In: Ferri F, Dwyer N, Raicevich S, Grifoni P, Altiok H, Andersen HT, Laouris Y, Silvestri C, ed. *Responsible research and innovation actions in science education, gender and ethics*. Cases and experiences Springer, Chapter 9. SpringerBriefs in Research and Innovation Governance, Cham, Switzerland. p. 65–78.
- Possenti, V., Minardi, V., Contoli, B., Gallo, R., Lana, S., Bertozzi, N., et al. (2021). The two behavioural risk factor surveillances on the adult and elderly populations as information systems for leveraging data on health-related Sustainable Development Goals in Italy. *Int. J. Med. Inform.* 152, 104443. doi: 10.1016/j.ijm.2021.104443
- Rufo, F. (2017). Knowledge and participation. Moving towards scientific citizenship. *Ann. Istituto Superiore di Sanità*. 53, 3–4.
- St Leger, L. H. (1999). The opportunities and effectiveness of the health promoting primary school in improving child health—a review of the claims and evidence. *Health Educ. Res.* 14, 51–69. doi: 10.1093/her/14.1.51
- Von Schomberg, R. (2013). A vision of responsible innovation. In: Owen, R., Heintz, M., and Bessant, J. (eds.) *Responsible Innovation*. London: John Wiley. doi: 10.1002/9781118551424.ch3
- Von Schomberg, R., and Hankins, J. (2019). *International Handbook on Responsible Innovation. A global resource*. Edward Elgar Publishing. doi: 10.4337/9781784718862
- World Health Organization (WHO). (2009). Nairobi Call to Action. In: 7th Global Conference on Health Promotion, Nairobi, Kenya.
- World Health Organization (WHO). (2020). Risk communication and community engagement readiness and response to the 2019 novel coronavirus (2019-nCoV). Interim guidance v2. WHO/2019-nCoV/RCCE/v2020.2.
- World Health Organization (WHO). (2021a). Countries urged to develop pandemic preparedness and response treaty. Available online at: <https://news.un.org/en/story/2021/07/1096662>. (accessed August 13, 2021).
- World Health Organization (WHO). (2021b). Everything in the COVID-19 pandemic is about trust. Available online at: <https://cs-cz.facebook.com/WHO/videos/everything-in-the-covid-19-pandemic-is-about-trust/455283145575462/>. (accessed August 13, 2021).
- Xiang, D. H., Kontos, C. K., Veloudaki, A., Baka, A., Karnaki, P., and Linos, A. (2017). Health communication training in medical education – the importance for patients and communities. In *Continuous Training for Medical Professionals. The case for health communication and disaster preparedness training. Paper series 7*. Zadic srl, Rome, Italy, pp. 5–11. Available online at: [http://www.asset-scienceinsociety.eu/sites/default/files/7th\\_paper\\_series.pdf](http://www.asset-scienceinsociety.eu/sites/default/files/7th_paper_series.pdf). (accessed February 17, 2021).

Yaghmaei, E., and Van de Poel, I. (2021). *Assessment of Responsible Innovation: Methods and Practices*. London and New York: Routledge. doi: 10.4324/9780429298998

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